



# LTSI Project update

*Long Term Support Initiative*

Tsugikazu SHIBATA, NEC

21, February 2017

Embedded Linux Conference

Hilton Portland, OR

# Who am I

- Tsugikazu SHIBATA, NEC
- Founder and project lead of LTSI (Long Term Support Initiative)
- Involved with Linux kernel since 2.4, worked for both industry and community
- Board member of Linux Foundation

# Linux is running everywhere

- ***Multiple use cases***
  - NYSE, London, Tokyo Stock Exchange
  - Network infrastructure
  - Amazon, Google, Facebook, Twitter
  - Smart Phone, TV, Camera, Router,
- ***Multiple architectures***
  - x86, arm, s390, ia64, mips, parisc, sparc, sh ...
- All those come from ***Single Source code*** tree

# Developed by the community

- ~1700 developer, ~230 companies every release
- Yearly 1.5Mlines of code, 4000 files increased
  - Continue to grow code by developers
- 26 Years of history
- Maintainers have great skill to manage the subsystem and professional knowledge of its area of technologies

# Status of Latest Linux Kernel

- Latest released Kernel : 4.10
  - Released: February 19<sup>th</sup> , 2016
  - Lines of code : 22,839,659 (+491,303)
  - Files : 57,172 (+966)
  - Developed period: 70 days
- Current Stable Kernel: 4.9.11
- Current development kernel: In the merge window toward 4.11-rc1

# Kernel release cycle

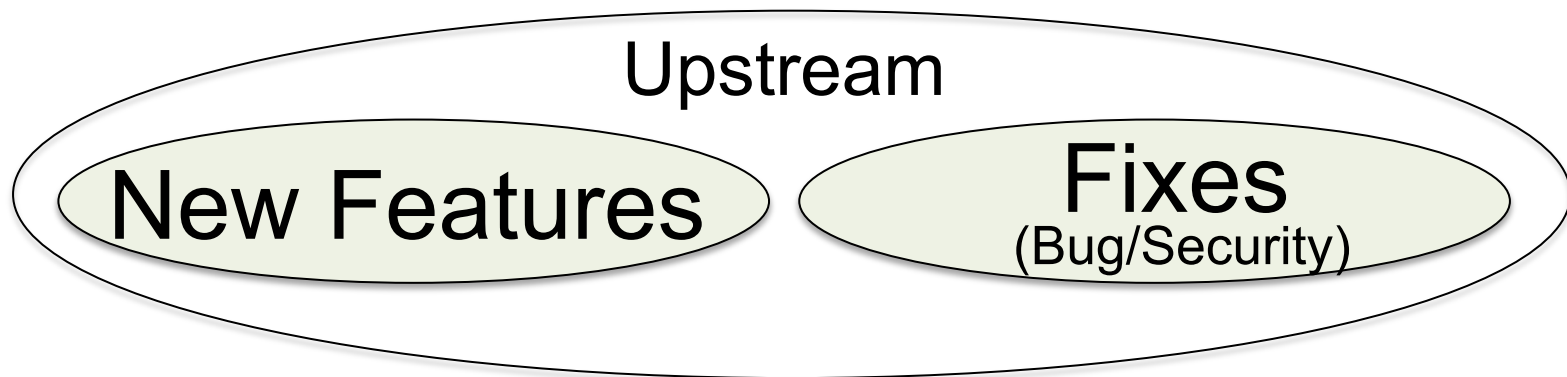
- Release cycle: 65 ~ 70 days, 5~6 releases/year

Version	Release	Rel. span
3.10	2013-6-30	63
3.11	2013-9-2	64
3.12	2013-11-15	74
3.13	2014-1-21	67
3.14	2014-3-30	68
3.15	2014-6-8	70
3.16	2014-8-3	56
3.17	2014-10-5	63
3.18	2014-12-7	63
3.19	2015-2-9	64

Version	Release	Rel. span
4.0	2015-4-12	62
4.1	2015-6-22	71
4.2	2015-8-30	69
4.3	2015-11-2	64
4.4	2016-1-10	68
4.5	2016-3-14	64
4.6	2016-5-15	63
4.7	2016-7-24	70
4.8	2016-10-2	70
4.9	2016-12-11	70

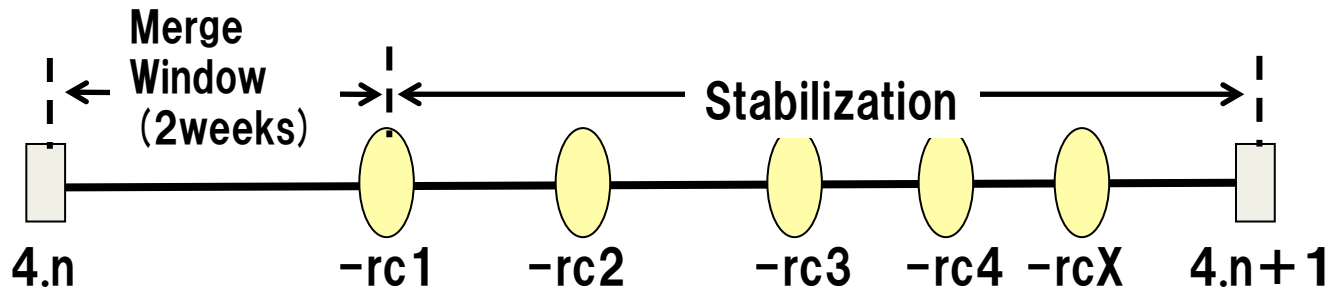
# Linux development policy

- Upstream is only the place to accept the patches
  - Reviewed by skilled maintainer
  - Tested with other proposals to confirm no conflicts
  - Well coordinated development process for over thousand developers



# Linux Development process

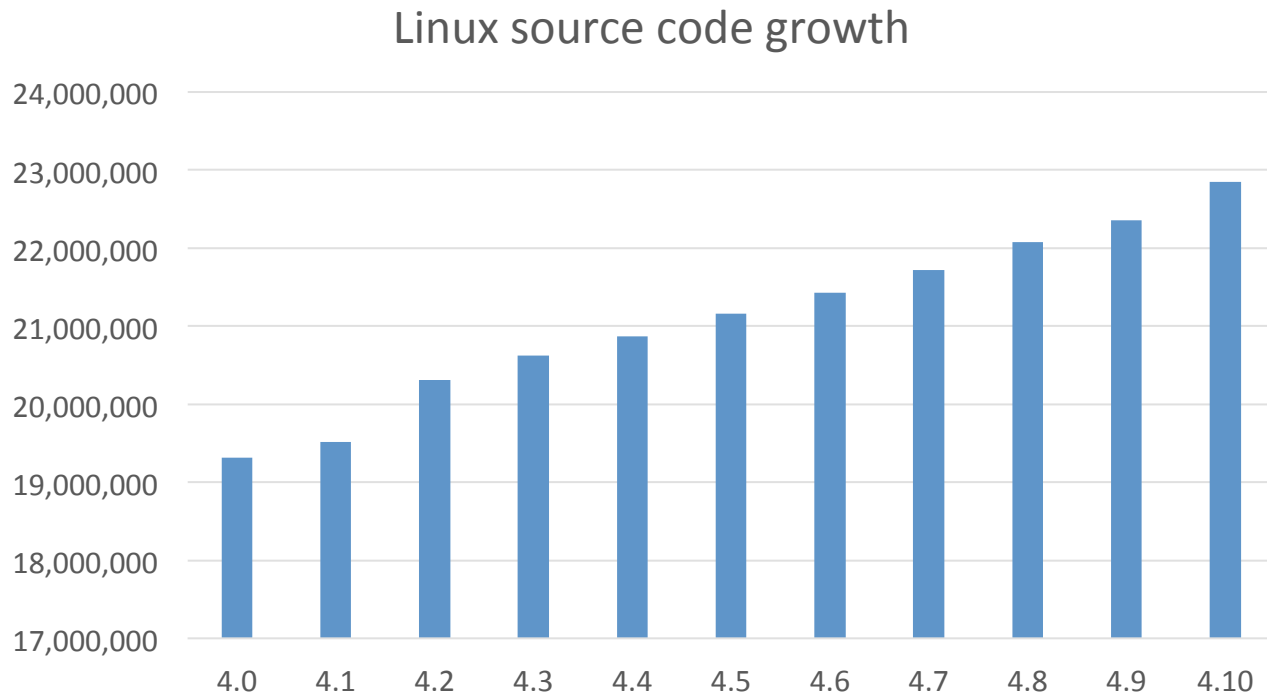
- Just after the release of 4.n, two weeks of merge window will be opened for proposal of new features
- After 2 weeks of merge window, -rc1 will be released and the stabilization will be started
- 4.n+1 will be released when it becomes reasonably stable by some of -rcX released





# Linux Source Code Growth

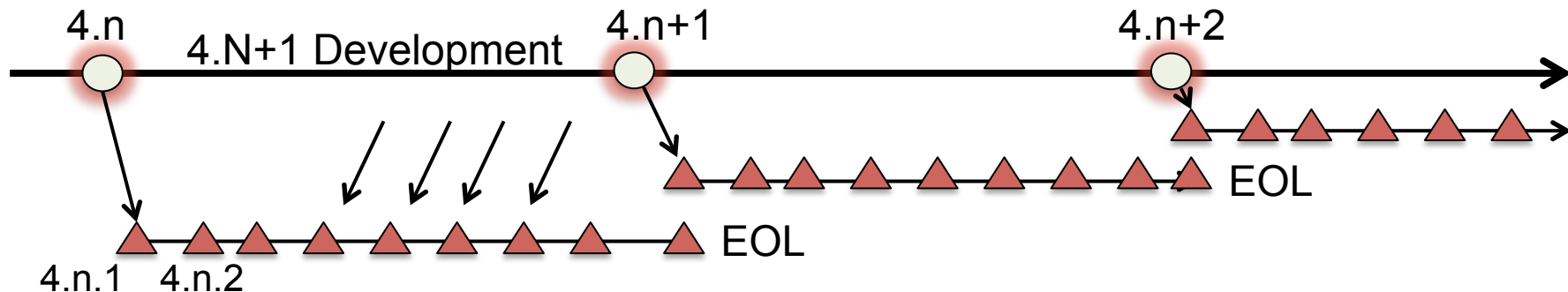
- Increasing 0.3ML/Version, 1.5ML/year



# Rapid Release cycle of Linux

- Yearly more than 5 times of chance to the code into upstream. Other project maybe 6month release cycle that is 2 times/year
- So many choice for our own products. Need deeper knowledge to pick right version.

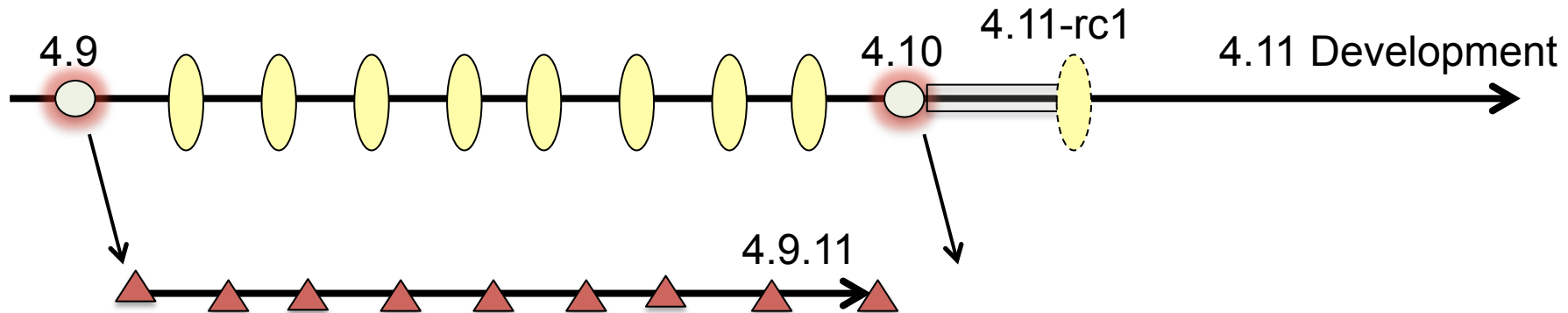
# Stable kernel release



- Recommended branch for users who want the most recent stable kernel
- 3 part version like 4.n.m
- Contain small and critical fixes for security problems or significant regressions discovered in a latest development version
- Becomes End Of Life when next stable kernel were released

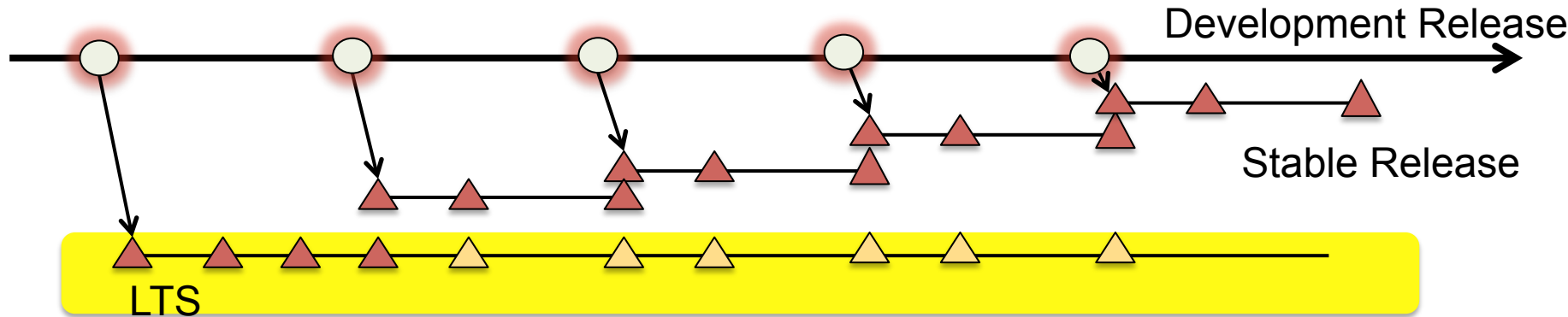
# Status of Latest Linux Kernel Again

- Latest released Kernel : 4.10
- Current Stable Kernel: 4.9.11
- Current development kernel: in the merge window for 4.11-rc1



# LTS: Long Term Stable Kernel

- Extended maintenance period for stable kernel
- Kernel tree continue to back port bug and Security fixes for more long term
- Pick one version per year and maintain 2 years



# Why LTS?

- Only the tree get fixes from the community
- In the real use case, tested/confirmed kernel is important, less important for new features
- Fixes will be released # of times and should be applied frequently, Security/Bug fixes are being more important
- Bugs found in LTS should be reported and fixed in upstream

# Current LTS versions

Version	Maintainer	Released	Projected EOL
4.9	Greg Kroah-Hartman	2016-12-11	Jan, 2019
4.4	Greg Kroah-Hartman	2016-01-10	Feb, 2018
4.1	Sasha Levin	2015-06-21	Sep, 2017
3.18	Sasha Levin	2014-12-07	Jan, 2017
3.16	Ben Hutchings	2014-08-03	Apr, 2020
3.12	Jiri Slaby	2013-11-03	May, 2017
3.10	Willy Tarreau	2013-06-30	Oct, 2017
3.4	Li Zefan	2012-05-20	Apr, 2017
3.2	Ben Hutchings	2012-01-04	May, 2018

<https://www.kernel.org/category/releases.html>

# LTS includes large number of fixes

- 600 – 700 fixes included in a Stable release
- LTS include several thousands of fixes

As of 2017/2/5

Version		# of commits
From	To	
<b>3.0</b>	<b>3.0.101</b>	<b>3953 (EOL)</b>
3.1	3.1.10	695 (EOL)
<b>3.2</b>	<b>3.2.84</b>	<b>7320</b>
3.3	3.3.8	698 (EOL)
<b>3.4</b>	<b>3.4.113</b>	<b>5929</b>
3.5	3.5.7	816 (EOL)
3.6	3.6.11	757 (EOL)
3.7	3.7.10	718 (EOL)
3.8	3.8.13	996 (EOL)
3.9	3.9.11	746 (EOL)

Version		# of commits
From	To	
<b>3.10</b>	<b>3.10.104</b>	<b>5727</b>
3.11	3.11.10	677 (EOL)
<b>3.12</b>	<b>3.12.70</b>	<b>7342</b>
3.13	3.13.11	903 (EOL)
<b>3.14</b>	<b>3.14.79</b>	<b>4977(EOL)</b>
3.15	3.15.10	703 (EOL)
<b>3.16</b>	<b>3.16.39</b>	<b>5599</b>
3.17	3.17.8	884 (EOL)
<b>3.18</b>	<b>3.18.47</b>	<b>4083</b>
3.19	3.19.8	873(EOL)

Version		# of commits
From	To	
4.0	4.0.9	757(EOL)
<b>4.1</b>	<b>4.1.38</b>	<b>3510</b>
4.2	4.2.8	903(EOL)
4.3	4.3.6	618(EOL)
<b>4.4</b>	<b>4.4.47</b>	<b>3649</b>
4.5	4.5.7	973(EOL)
4.6	4.6.7	705(EOL)
4.7	4.7.10	912(EOL)
4.8	4.8.17	1102(EOL)
<b>4.9</b>	<b>4.9.8</b>	<b>841</b>



# # of Fixes in LTS

Version	Maintainer	Released	Years maintained	Total fixes	Fixes/year
4.9	Greg Kroah-Hartman	2016-12-11	0.2	841	841
4.4	Greg Kroah-Hartman	2016-01-10	1.1	3649	3389.0
4.1	Sasha Levin	2015-06-21	1.6	3510	2149.6
3.18	Sasha Levin	2014-12-07	2.2	4083	1881.7
3.16	Ben Hutchings	2014-08-03	2.5	5599	2226.2
3.12	Jiri Slaby	2013-11-03	3.3	7342	2250.1
3.10	Willy Tarreau	2013-06-30	3.6	5727	1587.2
3.4	Li Zefan	2012-05-20	4.7	5929	1256.0
3.2	Ben Hutchings	2012-01-04	5.1	7320	1436.5

# LTSI Status

# What is LTSI

- Open Source community to create and maintain Linux kernel for long term
  - Based on LTS
  - Add another chance to include further patches on top of LTS
  - Same lifetime with LTS (yearly release and 2 years life time)
- Industry party to share practice and experience among the companies

# LTSI includes LTS

## LTSI

- ❑ Add vendor required features
- ❑ Share status, info, problem among industry people
- ❑ Huge testing by contributors
- ❑ Auto test frame-work
- ❑ Provide help developer for upstream

## LTS

- ❑ Release 1 version / year, Maintain 2 years
- ❑ Frequently and large number of bug /security fixes

# History of LTSI

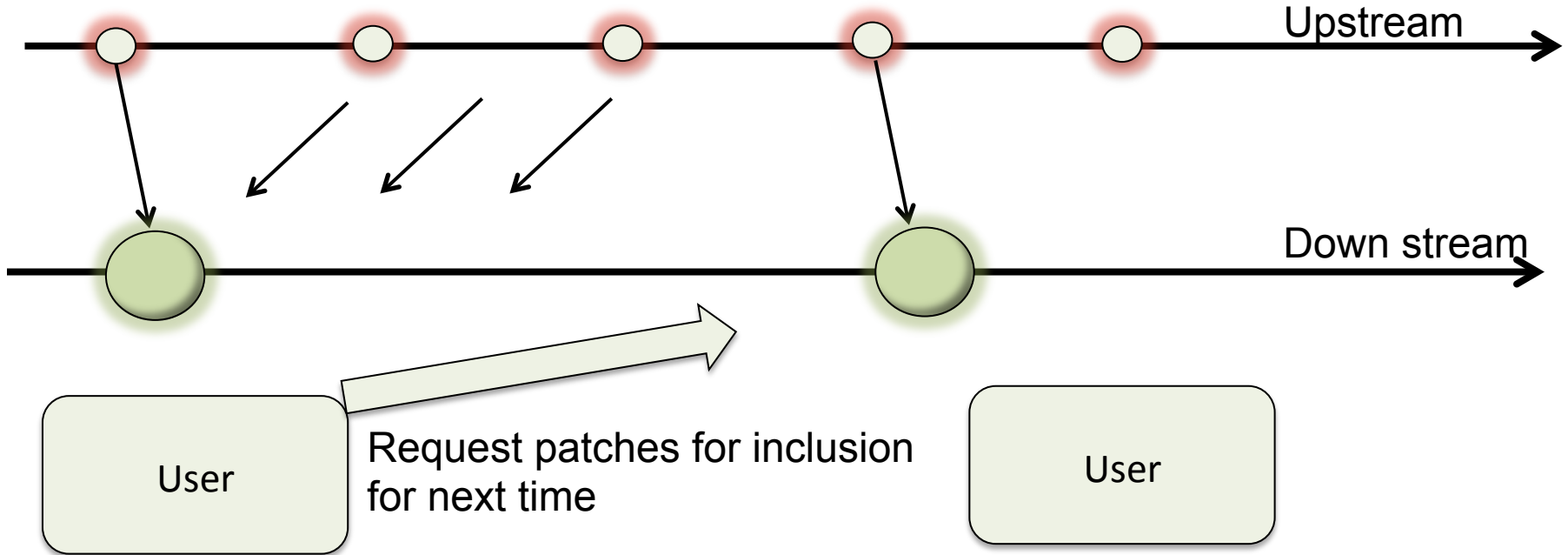
- Established 2011 – 6 years now
  - Started for stable Kernel for Android
- Integrated by Yocto (2012, May)
- Have had a workshop/session to share information and discuss issue among industry people
- Released yearly basis; 3.0, 3.4, 3.10, 3.14, 4.1

# Shape of LTSI Project

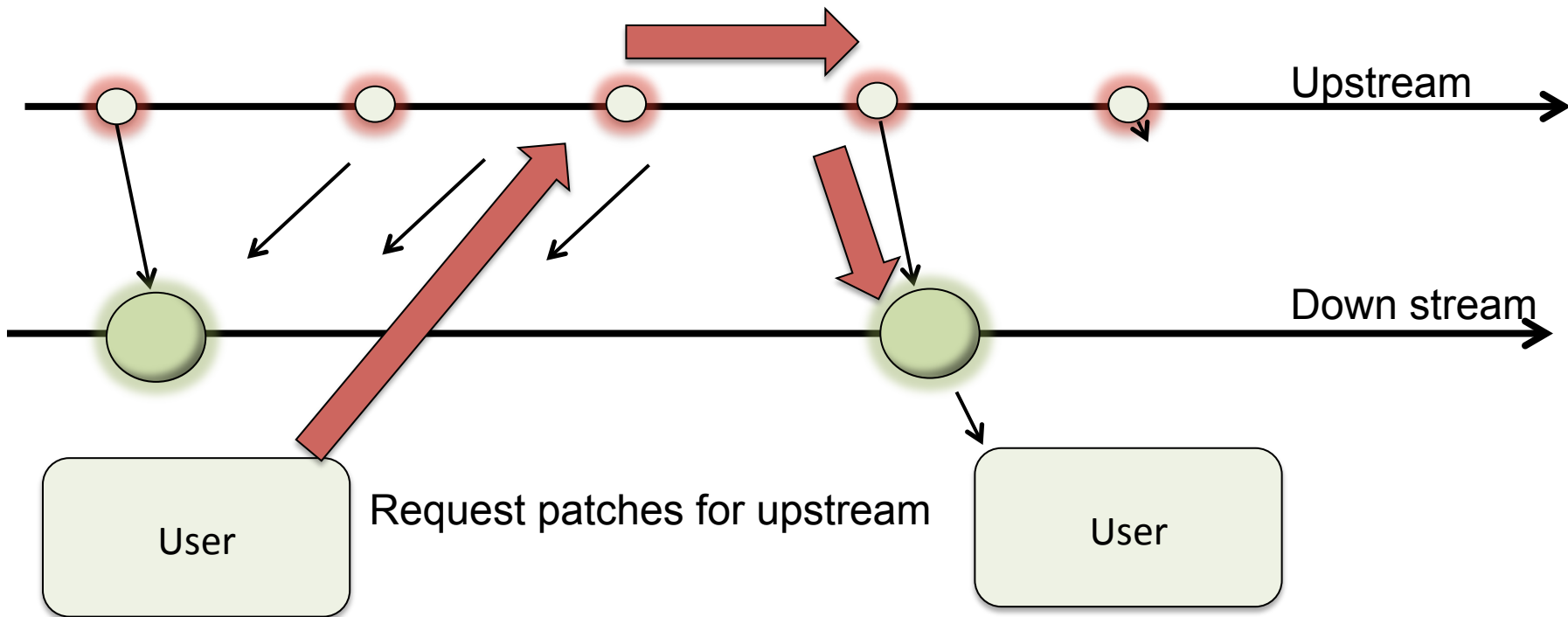
- Small staff to coordinate workshop , session at LF conference
- Maintainer: Greg Kroah-Hartman , Fellow of Linux Foundation
- Working with upstream Linux Community
- Keeping neutral position to be able to use for variety of use case

# OLD DAYS of Distro

2005 .. 2007



# Upstream first policy





# Production kernel

SoC Kernel

LTS

SoC's  
Add-on  
Patches

+

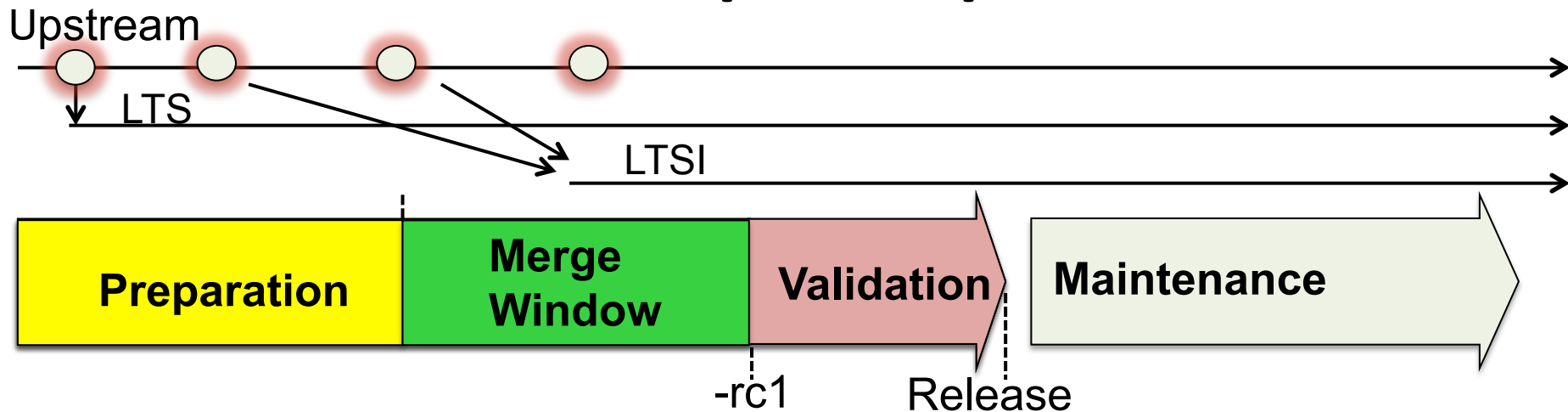
Own changes

Features      Driver

Fixes

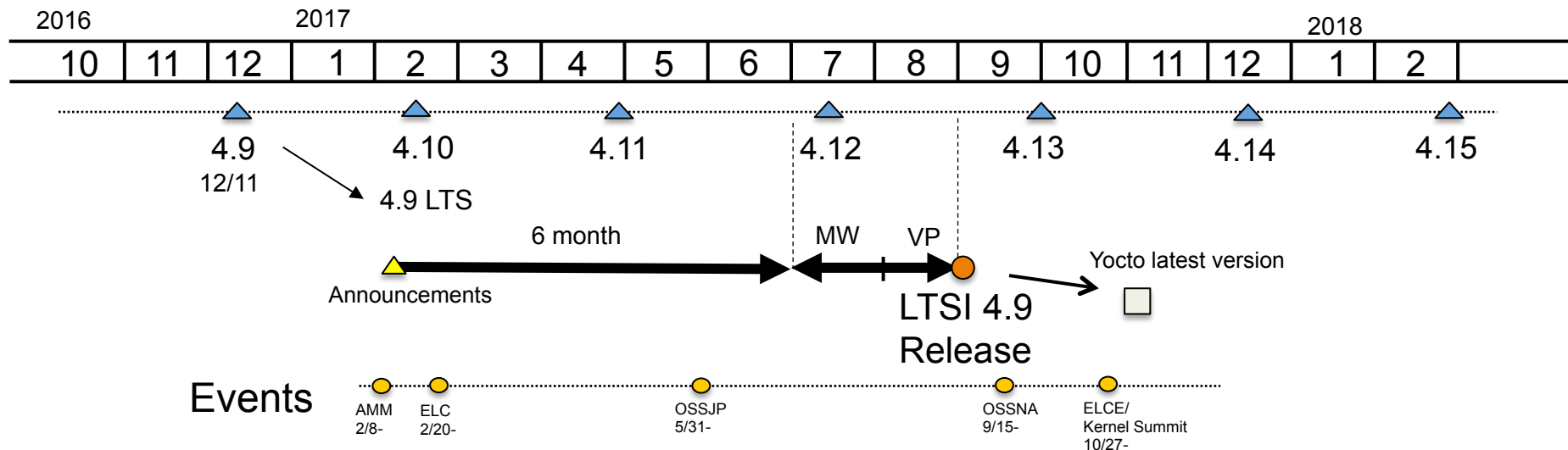
We need more chance to merge patches on top of LTS

# LTSI development process



- Preparation: 4-6 month (~2 of upstream release)
- Merge window: 1~2 month to propose additional patches.
  - Self contained or upstream features accepted
- Validation: a month or more. All the contributors must validate and report back

# LTSI 2017 Development plan



Announce	Merge Window	Validation Period	Release
2/21	July/1 - 31	August/1 - 31	September

# Tech Challenges for kernel area



- 64bits ARM support?
  - Both 32bits and 64bits need to be supported?
  - Migrating 32bits to 64bits takes long years
  - Maintaining 2 of Apps/libs may become double efforts
- VM support?
  - KVM/Xen on top of ARM architecture?
- Container support?
  - Container as packaging technology for delivering
  - Need both ARM support and 64bit
- We can use these technologies by back porting onto 4.9 using LTSI process

# LTSI related project and use case



- Fuego: Linux kernel auto testing
  - Preinstalled tests run by Jenkins+scripts inside container
- AGL: Automotive Grade Linux
  - UCB (Unified Code Base) 3.0 released January and demonstrated at CES
- CIP: Civil Infrastructure Project
  - Kernel Super Long support(SLTS) is discussing



CIVIL  
INFRASTRUCTURE  
PLATFORM

# Conclusion

- LTSI was started to fill the gap between community and industry but still there is the gap
  - We will continue our activity to discuss both side to better align each other
- Upstream first policy is important for Open Source
- Why don't you join LTSI?
  - By joining LTSI, you will be able to share best practice
  - Be able to get information for stable kernel

# THANK YOU

LTSI WorkShop Today

DateTime: Feb 21st, 2017, 4pm - 6pm

Venue: Director's Suite on the 3rd floor

Please Join !

# You can participate LTSI

- Follow on Twitter account:  
@LinuxLTSI



**LinuxLTSI**

@LinuxLTSI

*LTSI stands for Long-Term Support Initiative. A group of CE Working Group of the Linux Foundation to provide Long-Term and stable Linux for Industry*

- Web:  
<http://ltsi.linuxfoundation.org>
- Mailing list:  
<https://lists.linuxfoundation.org/mailman/listinfo/ltsi-dev>
- Git tree :  
<http://git.linuxfoundation.org/?p=ltsi-ernel.git;a=summary>